Vol. No. 150 **January 7, 2003**

US Army Corps of Engineers
Detroit District

Great Lakes Update

2002 Annual Summary

At times during 2002, each of the Great Lakes experienced water levels that were higher than the year before. The combination of a wet fall in 2001, near average snow pack in the northern basin and a wet spring in 2002 accounted for the improvement. However, a hot dry summer across most of the Great Lakes basin led to below average water supplies, which negated the improvements of a year ago.

The levels of Lakes Superior, Michigan-Huron and St. Clair remained below their respective long-term averages (LTA) throughout the year. Lake Erie remained close to its LTA from February into June, but quickly fell below average beginning in July. Lake Ontario rose quickly to about a foot above average by June, but then fell just as quickly to below average by August. All of the Great Lakes are currently below their LTAs and are forecasted to remain there into 2003.

Hydrology

The main storm track in early 2002 was generally across the Ohio Valley. This track led to above average precipitation in many areas in the southern Great Lakes region. Cleveland, Ohio recorded over 4 inches of precipitation in March, while Buffalo, New York received close to 4.5 inches of precipitation in April. Temperatures were also above average in these areas.

Heavy snow also fell in the lake effect belts in early 2002 as cold dry air blew across the ice-free lakes. Marquette, Michigan set an all time record for February snowfall when close to 92 inches fell. That was followed in March by another 83 inches of snow.

Typically, snowpack over the basin is at its peak in early March, averaging nearly five inches of snow water equivalency (SWE). The U.S. National Weather Service conducts snow surveys using low-flying aircraft across the Lake Superior drainage basin each year to help in predictions of water supplies to the Great Lakes. The results for late February 2002 showed a near average snowpack (Figure 1). A similar survey will be made this winter and the results will be used to forecast water levels for the Great Lakes for the spring-autumn period.

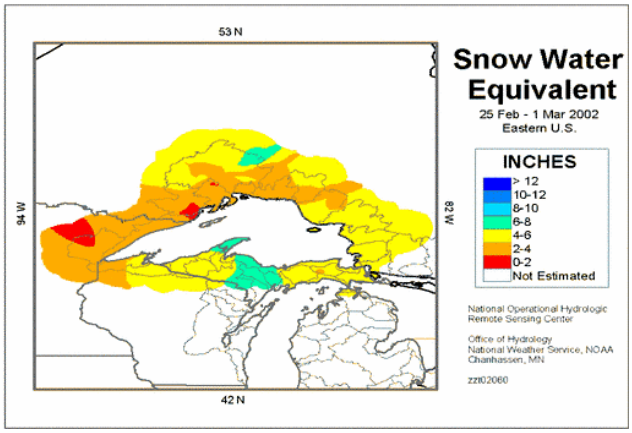

Figure 1

Summer arrived in the Great Lakes region accompanied by hot and dry conditions. Some areas in the region were categorized as experiencing a moderate drought. Abnormally dry to moderate drought conditions persisted over much of the Great Lakes into December 2002. Lakes Michigan-Huron supplies from September through November set a three-month record low for net basin supplies. This reflects decreased precipitation and increased evaporation in the basin.

Based on preliminary data from the U.S. National Weather Service and the Canadian Atmospheric Environment Service, precipitation over the Great Lakes basin for 2002 was 0.5 inches below the long-term basin-wide average of 32.4 inches.

Figure 2 compares the monthly deviation of precipitation from long-term averages for each month of the year for 2001 and 2002 over the Great Lakes basin. Precipitation in 2002 returned closer to average compared to 2001, which had wider deviations and was significantly above average overall. This figure also shows that precipitation patterns can be quite variable in any given year. Precipitation is usually the best indicator of net water supplies to the Great Lakes, but can be misleading at times.

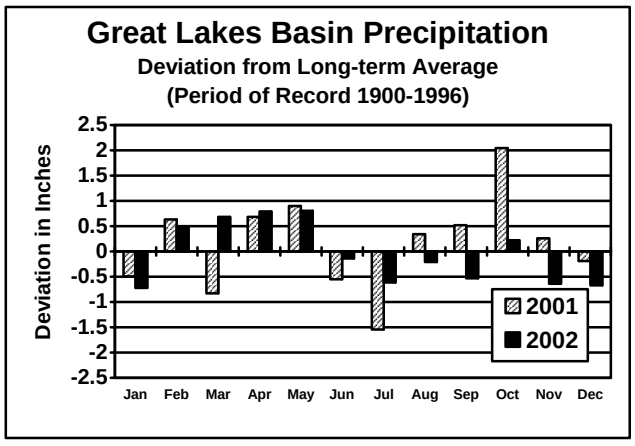

Figure 2

National Weather Service outlooks for January 2003 through March 2003 show a main storm track up the spine of the Appalachians. If these forecasts are correct, the Lakes Erie and Ontario basins could experience above average precipitation at times, while the northern Great Lakes would see below average precipitation.

The National Weather Service's Climate Prediction Center indicates the likelihood of above average temperatures and below average precipitation across the entire Great Lakes watershed into the New Year. This is largely due to the return of a moderate El Niño in the Pacific Ocean. Typical El Niño winters in the Great Lakes region tend to be warm and dry. If these predictions hold true, Great Lakes water levels may see little recovery from the current situation of below average levels into 2003.

Water Levels

The *Monthly Bulletin of Lake Levels for the Great Lakes* displays water levels on the Great Lakes for 2001 and 2002. The following discussion uses monthly mean levels.

Lake Superior levels started 2002 at 601.1 feet, 5 inches below its January LTA. A near average snow pack and a wetter than average period from February through June started levels rising in March. Levels continued to rise following the normal seasonal pattern, reaching chart datum by May. The lake peaked later than usual in October at 601.8 feet, 4 inches below the LTA. Normally, Lake Superior levels peak in August or September. Levels fell from October through December, ending the year at 601.2 feet, 6 inches below its December LTA and 2 inches lower than the year before.

Lakes Michigan-Huron levels began the year at 577.4 feet, 14 inches below its January LTA, but about 9 inches above its January 2001 starting level. Throughout most of 2002, levels were significantly higher than 2001 levels, but still remained below average. The lakes were 11 inches below the LTA at their peak of 578.5 feet in July, but 11 inches higher than in July 2001.

This increase was largely due to significantly above average precipitation in the latter part of 2001, resulting in increased lake levels during a time when the lake would normally be in decline. Lower than average supplies caused the lake to fall below chart datum in November and end the year in December at 577.1 feet, 18 inches below the December LTA and 6 inches lower than the year before.

Lake St. Clair levels started the year at 573.1 feet, 6 inches lower than its January LTA and about where it started the year in 2001. However, throughout 2002 levels remained below average but were higher than comparable 2001 levels. Lake St. Clair levels peaked in July at 574.5 feet, 4 inches below the LTA. Large amounts of "lake effect" snow on southern Lake Huron and some ice formation in the Detroit River resulted in small level increases in December. Levels then fell through December ending the year at 572.9 feet, 12 inches below its LTA and 5 inches below the year before.

Lake Erie levels began the year at 570.4 feet, 5 inches below its January LTA. Above average precipitation and supplies allowed the lake to rise to near average in February and remain near its monthly LTA into June. It peaked in June at 572.0 feet, at its LTA. Lower supplies combined with the seasonal decline caused levels to fall below average from July through December. The year ended with levels at 570.3 feet, 7 inches below the December LTA, and 2 inches below the year before.

Lake Ontario started 2002 at 244.6 feet, less than an inch above its January LTA. Above average supplies allowed levels to rise rapidly from February to a June peak of 247.1 feet, 11 inches above its LTA. As a result of the seasonal decline and reduced supplies, levels declined through December ending the year at 243.8 feet, 8 inches lower that its LTA and also 8 inches below the December 2001 level.

Lake Superior Regulation

During 2002, the International Lake Superior Board of Control (ILSBC) continued to use Regulation Plan 1977-A as the basis for determining Lake Superior outflows. The ILSBC is a bi-national body that reports to the International Joint Commission (IJC) on boundary water management issues including the management of outflows from Lake Superior.

Flow changes resulting from the monthly regulation of Lake Superior are accomplished by varying the amount of water allocated to hydropower production and, when necessary, by opening or closing gates in the Compensating Works at the head of the St. Marys Rapids.

Except for April, September and October, water supplies to Lake Superior were below average for the year. Annual precipitation over the basin was 106% of average and water supplies overall to Lake Superior were 85% of average.

Lake Superior's 2002 levels were higher than those of 2001, except for June when it was about 1 inch lower. A one-half open gate setting was maintained in the Compensating Works during 2002 to support fishery spawning in the St. Marys Rapids, except for the period from mid-August to mid-October. Although Plan 1977-A called for a one-half gate open setting from mid-August through mid-October, gates 9 through 16 were raised to a full-open setting one at a time to facilitate bottom seal repairs. An expected over-discharge, approved by the IJC, did not occur due to the inability of the United States hydropower plants to pass their full allocation. Due to automation modifications being made to the U.S. Government Hydropower plant generator, units at that plant were taken out of service for extended periods of time.

Flow variations as the result of peaking and ponding operations at the hydropower plants at Sault Ste. Marie cause the water levels in the St. Marys River downstream of the plants to fluctuate. With the water levels and Lake

Superior outflows below average, the fluctuations have become a subject of concern to commercial navigation users. In March 2002, the IJC approved continuation of peaking and ponding until March 2003, subject to prior approval by the Board at the beginning of each month.

One of the guidelines specifies that no ponding operations be allowed if they are expected to cause sustained weekend levels at the U.S. Slip gauge to be below chart datum. The Board suspended weekend ponding operations in April due to low levels at U.S. slip caused by a combination of low flow in the St. Marys River and the low water level conditions on Lake Huron. Ponding was also suspended on the weekends of December 7-8 and 14-15 due to low levels at U.S. Slip to facilitate ocean-going vessels that are affected by low water levels to exit the St. Marys River.

Outflows ranged from a low flow of 63,900 cubic feet per second (cfs) in March to a high of 79,800 (cfs) in August and September. Figure 3 above compares the monthly Lake Superior outflows in 2002 with long-term average flows for the 1900 - 1989 period of record. Further information can be found on the Internet at *http://www.lre.usace.army.mi/glhh*

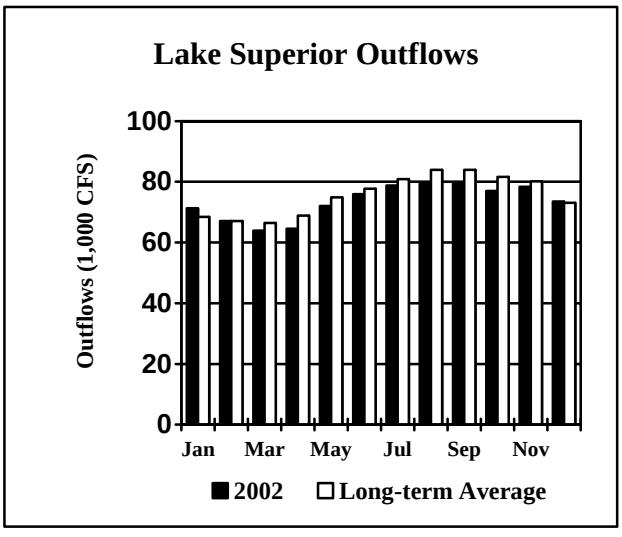

Figure 3

Lake Ontario Regulation

Late in 2001 all of the Great Lakes levels were higher than those of the previous year, but the Upper Great Lakes still remained below their LTAs. The supply of water to Lake Ontario from the upper lakes was therefore expected to remain below average going into 2002. The International St. Lawrence River Board of Control (ISLRBC) concluded that if hydrologic conditions for the winter months were dry, water levels and flows in the system would decrease, and critical hydropower and navigation needs would arise.

The ISLRBC implemented a strategy to retain the 1.1 inches of conserved water resulting from previous over and under discharges through 2001. They would then increase the conservation of water retained on Lake Ontario by another 2 inches to a total of 3.1 inches. This strategy of conserving water on the lake had proved valuable in the summer and early fall of 2001 in providing additional outflows to downstream St. Lawrence River users during low water level periods.

Beginning the 2002 regulation year, the water level of Lake Ontario was close to its long-term seasonal average. In early February, ice began to form in the St. Lawrence River. The Lake Ontario outflow was reduced to promote formation of a smooth, stable ice cover in the St. Lawrence River. This is typically done each winter after the navigation season closes.

Problems arose when the ice booms in the Beauharnois Canal broke. To avoid development of a serious ice related problem in the canal and to reduce adverse impacts on hydropower generation, the Lake Ontario outflow was reduced to less than that specified by the regulation plan until March 2. The under-discharge and an increase in water supplies to Lake Ontario, resulted in the amount of water conserved increasing from 1.1 inches to 3.8 inches, exceeding the goal of 3.1 inches and raising the level of Lake Ontario to 245.2 feet,

5.5 inches above average by early March. The last day of ice on the Beauharnois Canal was March 8. The International reach only had ice from February 12 until February 24, resulting in the shortest ice season of record. During March, over-discharges were made to reduce the storage on Lake Ontario from 3.8 to 3.1 inches.

Following relatively dry conditions on the Lake Ontario basin during the winter, precipitation on the lower Great Lakes basin increased considerably in the spring, causing the water level of Lake Ontario to rise rapidly. In April and May, the water level of Lake Ontario rose at a much faster rate than average due to above average precipitation. The ISLRBC approved over-discharges in May to reduce the amount of stored water on Lake Ontario from 3.1 inches to 2.3 inches, or until Lake Ontario had peaked. This would leave some reserved water for critical needs of navigation and power generation later in the year. The Board's decision to release some of the stored water was due to a concern of potential adverse impacts on Lake Ontario shore property interests.

Heavy rains fell in the upper St. Lawrence River valley and the Ottawa River Basin for several days starting June 11. Water levels in the Montreal region rose above flood alert for four days. As a result of the high water levels in the region, the over-discharge of Lake Ontario was suspended for one week, resuming on June 22. The actual daily mean water level of Lake Ontario peaked on June 22 at 247.2 feet, which was 12.2 inches above the LTA for that time of year.

Given the above-average Lake Ontario level conditions, the Board decided in late June to eliminate all the water previously retained on the Lake. This plan was accomplished by September 5 through over-discharges, including short-term flow increases to assist navigation at the Port of Montreal, extra water for hydropower generation during the July and early August heat wave, and increases to maintain sufficient levels on Lake St. Louis and the Montreal region. On September 5, Lake Ontario was at 245.1 feet, 2.0 inches below the seasonal average.

By mid-September, with Lake Ontario, Lake St. Louis and Montreal Harbor all well below their respective averages, the Board adopted a strategy where over-discharges were still allowed to meet critical hydropower needs, assist in navigation at the Port of Montreal, and maintain at least 67.6 feet on Lake St. Louis, as well as provide some assistance to recreational boaters. However, they were limited to a point such that an equivalent of a maximum up to 3.1 inches of water could be removed from Lake Ontario relative to Plan 1958-D.

Additionally, if downstream conditions were favorable, the strategy allowed for less than Plan 1958-D outflows to conserve water on Lake Ontario for future use in providing relief to users downstream in the St. Lawrence River. Throughout the summer and fall, the various over-discharges directed by the Board lead to an accumulated deviation by the end of November equivalent to about 1.5 inches of conserved water removed from Lake Ontario. With improved water level conditions in the Montreal region of the St. Lawrence River, outflows as specified by the regulation plan were resumed.

Figure 4 compares 2002 Lake Ontario outflows with period of record (1900 - 1989) LTA outflows. Further information on ILSBC

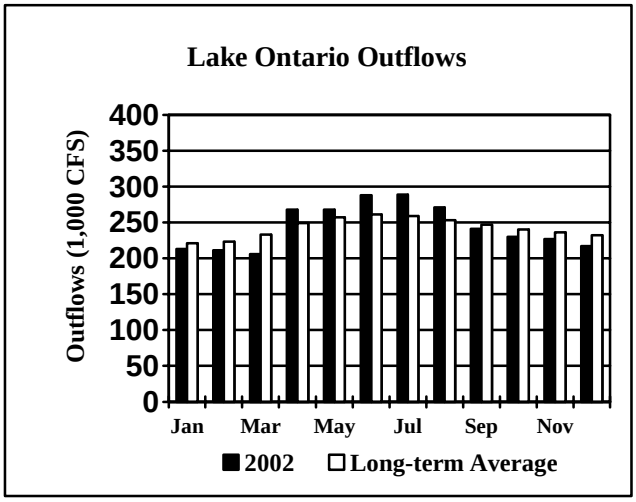

Figure 4

activities can be found on the Internet at: *http://www.islrbc.org./*

Public Concerns

Lake levels were higher in 2002 compared to 2001 but still remained below average. The higher levels appear to have alleviated some of the earlier low water level concerns of the public. However, inquiries continued to be received by the U.S. Army Corps of Engineers and Environment Canada staff. Many calls were from the news media interested in the status of lake levels and their effects on the economics and ecology of the region.

Upper Great Lakes Plan of Study

In January 2002, the Upper Great Lakes Plan of Study team, which was assembled by the IJC in August 2001, submitted a final Plan of Study to review the current regulation of outflows from Lake Superior. Much public input was considered in finalizing the Plan. The Plan was accepted by the IJC and made public in April 2002. The final Plan can be found at: *http://www.lre.usace.army.mil/Storage/HH/IJC/uglpos/pos.pdf*

International Lake Ontario - St. Lawrence River Study Progress Report

The International Lake Ontario - St. Lawrence River Study was set in motion in 2000 by the IJC to assess and evaluate the Commission's Order of Approval used to regulate outflows from Lake Ontario through the St. Lawrence River. The current Order of Approval requires that the St. Lawrence Seaway Power Project be operated to meet certain conditions and criteria to protect the interests in both countries including shoreline communities, commercial navigation and hydropower production. The Study is also evaluating the impacts of changing water levels on environmental factors, shore erosion, flood damages, recreational boating, and tourism.

Although it is too early for results, great progress has been made in the first year of the Study. Areas of concern have been identified and information is being gathered to move the study toward its goal of making a recommendation to the IJC for a new plan for regulation of outflows from Lake Ontario through the St. Lawrence River.

The study has nine technical work groups. Areas being studies include coastal erosion, commercial navigation, power generation, recreational boating, and water use interests as well as environmental factors. The Coastal Group developed a framework for a flood and erosion prediction system during the first year. The Commercial Navigation Group has been collecting data on commercial vessels, voyages, cargo carried, and ports. Participants in the Hydrology and Hydraulics Group are developing models to simulate levels, flows and other hydraulic conditions that would result from various regulation plans with different scenarios. The Power Generation Group is developing a report describing the state of the industry in terms of present and future trends, market factors, and effects of climate change. The Environmental Technical Work Group identified 46 different wetland sites for ecosystem study.

A marina survey performed by the Recreational Boating Group this past summer is complete. They are now working on a survey of New York State registered boaters that use Lake Ontario and the St. Lawrence River. "We will combine the information from the two surveys to produce overall estimates of losses to marinas, losses in boating opportunities, and losses in tourism-related revenues to local communities due to variations in high and low water levels," said Jonathan Brown, U. S. co-lead for the Recreational Boating Group.

The Industrial, Municipal and Domestic Water Uses Group is currently investigating the impacts of levels on near shore wells along the lake and river. They are trying to gather information on the extent and severity of the impacts for further evaluation. If you have a shore well on Lake Ontario or the St. Lawrence River and are experiencing problems related to levels, please contact the Study Team through the website given below.

An integral part of the Study is the Public Interest Advisory Group. During the group's first year, they gave over 30 presentations to various stakeholder groups. This helped to create an awareness of the study and passed the concerns of the public along to the study team. A summary of the group's activities and comments and concerns raised to the Public Interest Advisory Group by the public are included in their Year 1 Report.

As the study progresses, preferences of the stakeholders in each of the interest groups will be defined. A shared vision model developed by the Plan Formulation and Evaluation Group will be used to evaluate the effectiveness of a new regulation plan based on those preferences. "Because the Lake Ontario-St. Lawrence River System is so complex, it will be difficult to please all interests at all times," said Dr. Tony Eberhardt, U. S. General Manger for the study. "But the shared vision model will allow all interests to participate and help shape the new regulation plan."

Copies of the first year progress reports for the Study and the Public Interest Advisory Group are available on the study website at *http://www.losl.org/* or by contacting the communications contact in the Secretariat offices indicated below. If you are interested in sharing your concerns about water levels in Lake Ontario and the St. Lawrence River, would like to receive more information about the study, or would like to participate in one of our meetings, please contact the public affairs person in your country.

U.S.
Arleen K. Kreusch, Public Affairs Specialist
Lake Ontario-St. Lawrence River Study
1776 Niagara Street
Buffalo, NY 14207
Tel: (716) 879-4438
Fax: (716) 879-4356
arleen.k.kreusch@usace.army.mil

Canada
Arianne M. Matte, Public Information Officer
Lake Ontario-St. Lawrence River Study
234 Laurier Avenue West
22nd Floor
Ottawa, ON K1P 6K6
Tel: (613) 992-5727
Fax: (613) 995-9644
Comm_officer@ottawa.ijc.org

Meetings with the Public

The ILSBC held its annual public meeting on June 25, 2002 in Paradise, Michigan. The Board plans to hold its 2003 public meeting in Sault Ste. Marie, Ontario in late June. Information on this meeting will be posted on the Board's website at:
http://www.lre.usace.army.mil/Storage/HH/IJC/Superior/index.shtml

The St. Lawrence River Board of Control held one public hearing this year in Ogdensburg, New York on September 19, 2002. It also held one multi-city conference call for the public on March 21, 2002. The cities included Montreal, Quebec; Cornwall, Ontario; Toronto, Ontario; Alexandria Bay, New York; and Rochester, New York. More information can be found at the Board's website: *http://www.islrbc.org/*

The International Niagara Board of Control (INBC) held its annual public meeting on September 16, 2002 in Niagara Falls, New York. For information on activities of the INBC please visit:
http://www.lre.usace.army.mil/Storage/HH/IJC/Niagra/index.shtml

Appointments to the IJC

Three new commissioners have been appointed to the U.S. Section of the IJC. They are Mr. Dennis L. Schornack (U.S. Chairman), Ms. Irene B. Brooks and Mr. Allen I. Olson. Biographical information on these new appointees can be found at *http://www.ijc.org/comm/bio.html*.

Commercial Navigation

The Soo Locks opened the 2002 shipping season as scheduled on March 25, 2002. Through November 2002, the estimated tonnage passing through the Soo Locks at Sault Ste. Marie, Michigan was about 5.4% above the comparable 2001 tonnage. U.S. and Canadian vessels carried 15.6 and 51.9 million short tons of cargo respectively, as compared to respective 2001 tonnages of 14.2 and 49.5 million short tons. Foreign vessels carried about 4.6 million short tons, down about 1.2% from a 2001 tonnage of 4.7 million short tons.

Through November, an estimated total of 7,951 vessels had transited the locks compared to 6,664 vessels the previous year. Cargo vessels totaled 3,963 compared to 3,230 the year before. There were 2,272 U.S. flagged vessels, 1,222 Canadian flagged and 469 foreign flagged vessels or (ocean going or "salties"). Other vessels transiting the locks such as pleasure craft, tour boats, Coast Guard and scientific research vessels numbered 3,988. The U. S. locks close on January 15, 2003 and reopen March 25, 2003.

The Canadian lock at Sault Ste. Marie, Ontario reopened on May 14, 2002. By season-end on October 15, 2002, a total of 3,225 vessels (primarily pleasure craft and tour boats, commercial and government vessels) carrying 108,235 passengers had transited the lock. It is expected to reopen in mid-May 2003.

According to preliminary figures through November 2002, tonnage passing through the Lake Ontario-Montreal section of the St. Lawrence Seaway was down about 1.5% over 2001 at about 27.0 million metric tons (MMT). Vessel traffic was up about 1.4% over 2001 at 2,387 (combined lake and ocean vessels). The St. Lawrence Seaway Development Authority provided these figures.

Preliminary data on the type of cargo transiting the Seaway through November 2002 include: iron and steel (up 15.1% to about 2.7 MMT); grain (down 12.3% to about 8.5 MMT); coal (down 13.8% to about 0.31 MMT); general cargo (up 40.6% to about 4.0 MMT); and petroleum products (down 22.7% to about 1.1 MMT). For additional detail on Seaway activities visit their website on the Internet at: *http://www.greatlakes-seaway.com/.*

2002 Great Lakes Updates

These reports were published in 2002:

2001 Annual Summary, Vol. No. 146, January 5, 2002.

Ice Cover Impacts on the Great Lakes, Vol. No. 147, April 5, 2002.

Are Great Lakes Water Levels Recovering?, Vol. No. 148, July 2, 2002.

Geospatial Technologies for Great Lakes Water Management, Vol. No. 149, October 4, 2002.

Previous Update articles are available at: *http://www.lre.usace.army.mil/glhh/news*

General Notes

All elevations shown in this article are referenced to the IGLD 1985 datum.

Information about the Great Lakes water levels, outflows, and weather is available on the Internet.

Please visit: *http://www.lre.usace.army.mil/glhh*